FALL 2018 HOMEWORK 1 CEE 141

DUE: Monday, October 15th, 2018

NOTE: Perform calculations for ***LRFD*** method ONLY.

I. Complete the following problems from the textbook:

**Chapter 1:**

1-9: Provide a simple definition of structural design.

1-11: Give a description of both the LRFD and ASD design approaches.

1-13: Provide an example of three serviceability limit states.

**Chapter 2:**

2-2: Categorize the following loads as dead load, live load, snow load, wind load, seismic load, or special load.

a. Load on an office floor due to filing cabinets, desks, and computers.
b. Load on a roof from a permanent air handling unit.
c. Load on stadium bleachers from students jumping up and down during a college football game.
d. Load on a building caused by an explosion.
e. Weight on a steel beam from a concrete slab that it is supporting.
f. Load experienced by an office building in California as it shakes during an earthquake.
g. Load on a skyscraper in Chicago on a day with blustery conditions causing the building to sway back and forth.

2-3: What is one source you can consult to find the snow load data for a particular region as well as maps showing wind gust data to allow you to calculate wind loads?

2-4: Where in the AISC Manual can you find a table of selected unit weights of common building materials?

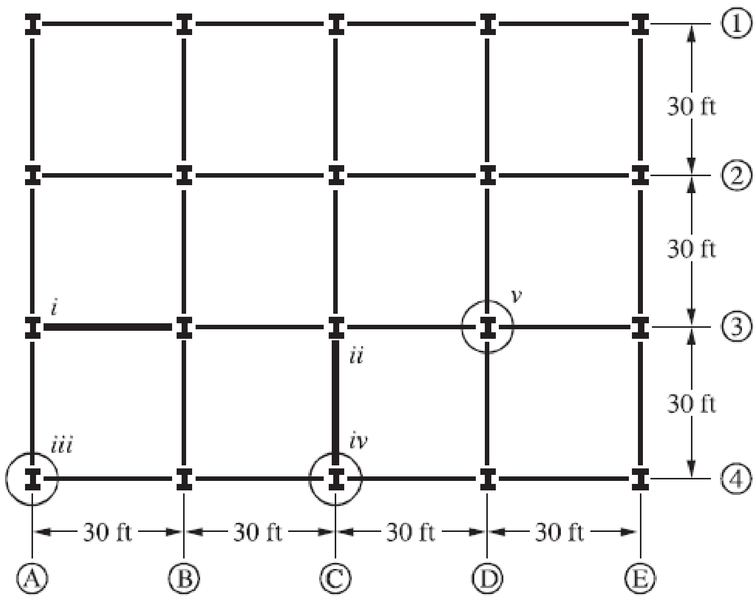
2-11: Using ASCE 7-10, determine the minimum uniformly distributed live load for a hospital operating room.

2-13: Using ASCE 7-10, determine the minimum uniformly distributed live load for an apartment building.

2-14: Determine the nominal uniformly distributed self-weight of a 6 in. thick reinforced concrete slab.

2-15: A building has a column layout as shown in Figure P2.15 with 30ft bays in each direction. It must support dead load of 90 psf and a uniform live load of 80 psf. Determine the required strength of the members noted below for design by LRFD.

**i.** The beam on column line 3 between column lines A and B if the deck spans from line 2-2 to 3-3 to 4-4.
**ii.** The girder on column line C between column lines 3 and 4 if the deck spans from line B-B to C-C to D-D.
**iii.** The column at the corner on lines 4 and A.
**iv.** The column on the edge at the intersection of lines C and 4.
**v.** The interior column at the intersection of column lines D and 3.



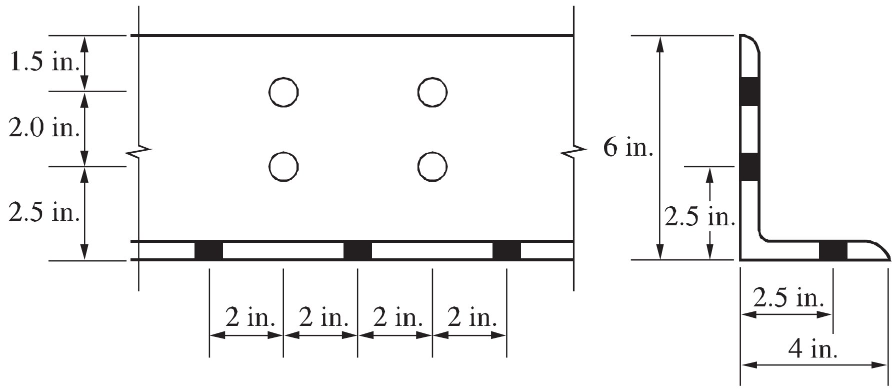

**Chapter 3:**

3-5: What happens to a steel element when it is loaded beyond the elastic limit and then unloaded?
3-6: Describe the difference between the yield stress and ultimate stress of a steel element.
3-9: What are the nominal and actual depths of a W14 × 730 wide-flange member? Compare these to the nominal and actual depths of a W14 × 145.

3-22: What grade of steel is most commonly used today in the production of W-shapes, and what are its yield stress and tensile stress?

**Chapter 4:**

4-16: Determine the net width for the L6 x 4 x 5/8 with 7/8 in. bolts shown in the figure bellow.




4-27: Determine the allowable strength of a WT7 x 15, A992 steel, with flanges welded to a ½ in. gusset plate by a 10 in. weld each side of the flange. Determine the design strength.

II. Also, answer the following problems:

1. A tension member is composed of **two** ½"x10" plates. They are connected to a gusset plate with the gusset plate between the two tension member plates, as shown in Figure 1. A36 steel and 3⁄4-inch-diameter bolts are used. Determine the nominal strength based on the net section.

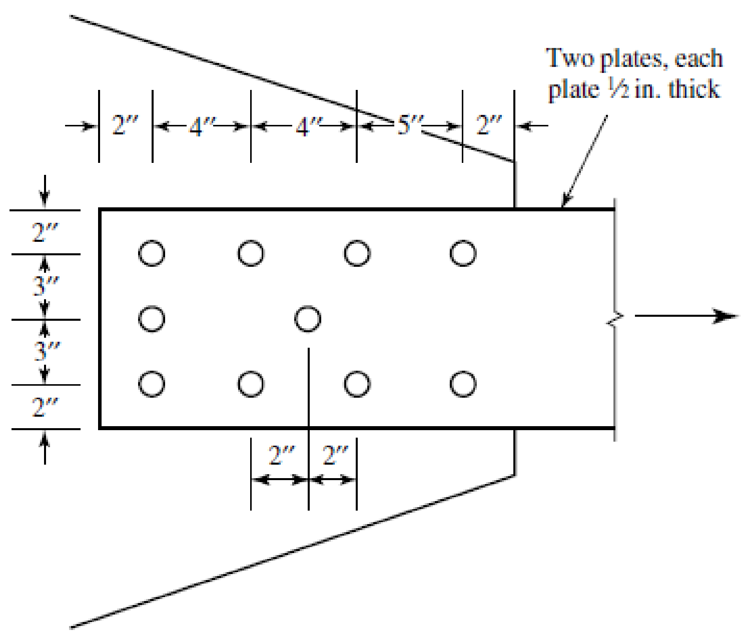



**Figure 1**

2. Use load and resistance factor design and select a **W** shape with a nominal depth of 10” (a W10) to resist a tension dead load of 175 kips and a tension live load of 175 kips. The connection will be through the flanges with two lines of 1¼” diameter bolts in each flange, as shown in Figure 3. Each line contains more than two bolts. The length of the member is 30 feet. Use A242 steel.

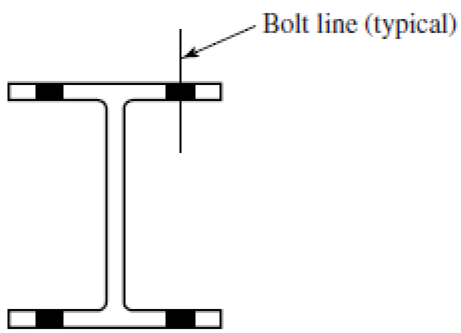



**Figure 2**